

1 Pseudo Three-dimensional Surface Code

In this section, we describe the pseudo three-dimensional Surface Code on the looped pipeline architecture introduced in Section ???. First, we describe how computation is performed on multiple 2D Surface Codes in a processor. Then, we extend this concept into a pseudo three-dimensional structure with a periodic cycle in the direction of the third dimension.

1.1 Quantum Processor

In fault-tolerant quantum computation, the surface code, introduced in Section. ??, is the most promising error correction code to be used for the calculation which is needed in many quantum algorithm. By the way, quantum low density parity check code (qLDPC) is often considered to be for quantum memory due to their high rate encoding rate. However single surface code can only single logical qubit, it has many advantages like simple way for universal logical operation using lattice surgery with magic state distillation.